Visualizing quantified self and objective patient data

Robin De Croon
Department of Computer Science, KU Leuven
Celestijnenlaan 200A
BE-3000 Leuven
Email: robin.decroon@cs.kuleuven.be

***Abstract*—This doctoral consortium paper discusses our research plans on interactive visualizations of quantified self data combined with the objective data in an electronic medical record. The main goal of the visualization is to support understanding and insight for patients and medical staff.**

I. Introduction

'Quantified self' or 'personal analytics' is concerned with people collecting personal (health) information for reflection and action at a later stage. Research shows that there are still several barriers to self-tracking: lack of time, insufficient motivation, unsuitable visualization and analytics tools, poor skills for analyzing data, and fragmented data scattered across multiple platforms [1]. In our research project, we will design interactive visualizations for a mobile device to tackle the 'unsuitable visualization and analytics tools', and 'the lack of skills to analyze data' barriers mentioned above. A specific novelty of what we propose is that quantified self data will be combined with the data measured by a GP, in order to enable the GP and the patient to gain new insights about the patient's health status. We primarily aim to focus on the GP as target user. Furthermore, the integration of quantified self data into the patient file can speed up the anamnesis part of a consultation and thus potentially decrease the time spend by a GP on a patient visit. We will make use of mobile affordances (sensors, multi touch, etc.) and try to tackle the derived limitations (small screen, etc.).

II. Research questions

In our research, we want to find out: 1) how we can find new insights into the patient's conditions by combining quantified self data and the objective measurements of a GP and 2) how the anamnesis process can be accelerated by integrating quantified self data into the patient record and thus potentially decrease the time spend on a patient visit. As a consequence, it should also be researched how quantified self data combined with objective measurements should be visualized to expose these insights in the patient's health status.

III. Resources and methods

We can rely on the gathered knowledge from earlier research [2] where we intensively worked with GPs to design and evaluate the interface of a mobile electronic health record. Furthermore, we have close connections with Corilus[1], the biggest supplier of medical software in Belgium: this will enable us to get access to real data, real patients and real GPs - though our earlier experience makes it clear that availability of GPs for evaluation studies is always an issue. Finally, this research is situated in the Data Visualization Lab[2] which provides us with the necessary expertise.

We will follow a user centered design methodology, where interviews with the GPs and patients are very important as we want to ground our research in real usage context. This means that GPs need to be able to touch the buttons and see how the visualizations actually work. Initially, paper prototypes will be constructed to verify the requirements without any investments in technology or development. With the help of structured interviews, think aloud user tests, task analysis, user tracking and analytics, etc., we can update and enhance the prototypes in each iteration. These prototypes will result in digital interactive visualizations, ready to integrate into the (mobile) electronic medical record of the GP. In order to prevent usability issues to influence our results, the usability of each prototype will be measured with the system usability scale (SUS). The final evaluations will be evaluated with scenario-based evaluations [3]. The total time saved will be measured through user tracking.

IV. Expected results

After the rapid prototyping process, we expect to have a mobile platform which integrates our interactive visualizations and will receive a SUS score of at least 80. These visualizations will help the GP to discover relevant (undiscovered) insights in the patient's health status. Furthermore, we hope to decrease the time spend per patient visit with ten percent. In addition, thanks to a raised patient awareness we hope to reduce the number of patient visits with five percent, as patients become more aware of their health conditions, they can try to remain healthy more efficiently.

References

[1] E. K. Choe, N. B. Lee, B. Lee, W. Pratt, and J. a. Kientz, "Understanding quantified-selfers' practices in collecting and exploring personal data," in *CHI '14*. ACM Press, 2014, pp. 1143–1152.

[2] R. De Croon, J. Klerkx, and E. Duval, "Designing a useful and usable mobile EMR application through a participatory design methodology: a case study," in *2014 IEEE International Conference on Healthcare Informatics - ICHI2014*. IEEE, 2014, (in press).

[3] H. Lam, E. Bertini, P. Isenberg, C. Plaisant, and S. Carpendale, "Empirical Studies in Information Visualization: Seven Scenarios." *IEEE transactions on visualization and computer graphics*, vol. 18, no. 9, pp. 1520–1536, Nov. 2011.

[1] http://www.corilus.be

[2] http://www.datavislab.org